Claims

1. An article comprising a body made of quartz glass having improved corrosion resistance against plasma, the quartz glass being doped with a metallic element, the quartz glass containing bubbles and crystalline phase at a quantity accounting for less than 100 mm^2 in a projection area per 100 cm^3 of the quartz glass body.

2. An article as claimed in Claim 1, wherein the metallic element has a boiling point higher than that of a Si fluoride.

3. An article as claimed in Claim 1, wherein the metallic element is able to react with fluorine to form a fluoride compound and the fluoride compound of said metallic element having a boiling point that is higher than that of the fluoride compound of Si (SiF_4).

4. An article as claimed in Claim 1, wherein the metallic element is one or two elements selected from the group consisting of Sm, Eu, Yb, Pm, Pr, Nd, Ce, Tb, Gd, Ba, Mg, Y, Tm, Dy, Ho, Er, Cd, Co, Cr, Cs, Zr, Al, In, Cu, Fe, Bi, Ga, and Ti.

5. An article as claimed in Claim 1, wherein said metallic element is present in a concentration in a range of from 0.1 to 20 % by weight.

6. An article as claimed in Claim 1, said quartz glass body having a metallic element-containing layer with a predetermined thickness containing 0.1 to 20 % by weight of said metallic element.

7. An article as claimed in Claim 5, wherein said metallic element-containing layer is a surface layer having a thickness of at least 5 mm.

8. An article as claimed in Claim 6, wherein the metallic element is additionally applied to a surface thereof.

9. An article as claimed in Claim 1, said quartz glass body having a surface roughness Ra of 0.01 to 10 μm.

10. An article as claimed in Claim 9, wherein said body has a surface that is brought into contact with a plasma corrosive gas, said surface being obtained by subjecting the surface to a precision cutting treatment, a heating and melting treatment, or a heating and melting treatment followed by a chemical etching treatment.

11. An article as claimed in Claim 1, wherein the quartz glass has an OH concentration of 100 to 2000 ppm.

12. An article as claimed in Claim 1, wherein 2 mol/m^3 or less of a gas are generated in a temperature range of from room temperature to 1000 °C.

13. An article as claimed in Claim 1, wherein the quartz glass has an internal transmittance for a visible radiation of 50 %/cm or higher.

14. An article comprising: a body made of quartz glass having improved corrosion resistance against plasma, said body having a metallic element applied to a surface thereof, the quartz glass containing bubbles and crystalline phase at a quantity accounting for less than 100 mm^2 in a projection area per 100 cm^3 of the quartz glass body.

15. An article as claimed in Claim 1, wherein the body is configured to function as a jig for supporting wafers.

16. A method for producing a quartz glass having improved resistance against plasma corrosion, said method comprising: producing a quartz glass ingot from a quartz powder by means of Verneuil method; providing a mixture of an SiO_2-powder and a metal containing substance containing a metallic element or a compound thereof; heating and fusing the mixture by dropping the heated and fused SiO_2-powder and the metal containing substance on a target area of said ingot while heating the target area of said quartz glass ingot to a temperature not lower than the melting temperature of the oxide of said metal.

17. A method as claimed in Claim 16, wherein said target area is heated to a temperature of 1800 °C or higher.

18. A method as claimed in Claim 17, wherein the metal containing substance is provided in form of a metal containing powder containing the metallic element or a compound thereof.

19. A method as claimed in Claim 16, wherein the metal containing substance is provided in form of a metal containing solution prepared by dissolving the metallic element or a compound thereof in pure water, an acidic solution, an alkaline solution, or an organic solvent.

20. A method for producing a quartz glass having improved resistance against plasma corrosion, said method comprising preparing a porous SiO_2 body; and heat treating said body in an atmosphere containing a metallic element at a concentration ranging from 0.1 to 10 mol per 22.4 liter.

21. A method as claimed in Claim 20, wherein during the heat treatment the body is exposed to a temperature not lower than a boiling point, a gasification point, or a decomposition point of said metallic element or the compound thereof, and to a pressure that is in a range of from 1 to 10 atmospheres.

22. A method for producing a quartz glass having improved resistance against plasma corrosion, said method comprising: preparing a slurry by dissolving in pure water, an acidic solution, an alkaline solution, or an organic solvent, a mixture of a quartz glass powder having a particle size distribution in a range of from 0.01 to 1,000 μm and containing from 1 to 50 % by weight of particles having a size ranging from 0.01 to 5 μm, with a metallic element or a compound thereof soluble in pure water, an acidic solution, an alkaline solution, or an organic solvent; drying and solidifying said slurry; and heating and fusing the solidified slurry in vacuum.

23. A method as claimed in Claim 22, wherein said metallic compound is a nitrate compound and the solvent is pure water.

24. A method for producing a quartz glass jig having improved resistance against plasma corrosion, said method comprising: coating the surface of a previously prepared quartz glass jig with a solution prepared by mixing and dissolving in pure water, an acidic solution, an alkaline solution, or an organic solvent, a metallic element or a compound thereof soluble in pure water, an acidic solution, an alkaline solution, or an organic solvent; and then heating and fusing the coated surface.

25. A method as claimed in Claim 24, wherein said solution containing said metallic element is a liquid organometallic compound containing the metallic element, or a solution prepared by dissolving an organometallic compund containing the metallic element in an organic solvent.